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(54) INDUSTRIAL CARTRIDGE

(71) DYNAMIT NOBEL AKTIENGESELLSCHAFT

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(74) HA

(57) Claim

1. Industrial cartridge with a casing containing a propellent charge, a base piece and arranged axially in the casing, an ignition guide tube which is connected to the base piece along with an igniter therearranged, characterised by the following features:

a) The propellent charge is composed of at least two propellent charge powders (2,3) burning with different speeds, arranged one after the other, which are separated from one another by a gas permeable covering (7) extending across towards the casing axis;

b) The ignition guide tube (5) possesses, provided at the level of the second or last propellent charge powder (2) away from the base piece, a covering (10) which is thinner than the wall (11) of the ignition guide tube;

c) The casing (9) contains at its end disposed opposite to the base piece (1) a closure (6) of a compressible material.

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DYNAMIT NOBEL AKTIENGESELLSCHAFT
5210 Troisdorf, District of Cologne

INDUSTRIAL CARTRIDGE

The invention relates to an industrial cartridge according to the preamble to claim 1.

It is known to break up or breach natural rock, concrete, masonry and the like from a drilled hole with a specific depth and a specific diameter by means of an explosive cartridge or a special apparatus with propellant cartridges. In German Patent Specification 1 195 696 is described an arrangement for shot firing. Whereas with use of explosive cartridges there takes place after the ignition detonation, propellant cartridges contain a propellent charge which burns away comparatively slowly (deflagration). Explosive cartridges are usually employed in the region of the lower third of the drilled bore, preferably at or near the deepest position of the drilled bore, and ignited. A commercially available propellant cartridge-containing special apparatus is the so called ROCK-BREAKER of the Company H.Jurgen Essig Berlin. After insertion of the explosive cartridge or the special apparatus with propellant cartridge, in addition, the drilled hole can be filled with water as damming or tamping. The water serves, inter alia, for transmission of the pressure of the combustion gases at the drilled hole wall and the deepest part of the drilled hole. In the case of the ROCK-BREAKER, the pressure existing after ignition of an industrial cartridge used in the apparatus transmitted by means of an impulse tube with radial openings to the water filling up the drilled bore. The hydrodynamic impulse effects the desired splitting for example of stone or concrete. The indicated apparatus possesses below the impulse tube in the working position a

cylindrically shaped rubber sleeve which is expanded through radial bores in the tube wall after ignition of the cartridge and achieves thereby a stabilisation of th apparatus in the drilled hole.

When employing explosive cartridges, extensive safety measures must be taken. The handling of the cartridges must take place by a man skilled in the art with corresponding training.

The apparatus working with explosive for cartridges, such as the indicated ROCK-BREAKER can, in contrast to the use of explosive cartridges, be driven with a smaller safety requirement.

The cartridges used for this are usally so formed that, after ignition of the propellent charge, they yield a gas pressure impulse of short duration. With such cartridges, however, even with use of suitable apparatus, lumps of rock and stone and the like are only reduced with difficulties, if these objects. for example stones, are large and/or possess a high strength. Therefore, the maximum size of material to be split with the ROCK-BREAKER along the edges at the surface containing the upper edge of the drilled hole is limited to about 40 to 50 cm, or cubes of between 1 and 1.2 m^3. With a size of more than 1.2 m^3, a plurality of drilled holes must be used. These difficulties can also not be reduced by employment of a cartridge with a large propellent charge, since in this case the gas pressure is merely increased in the drill hole, to escape without effect through fissures adjacent the bore in the material to be split and not to achieve an enlarging of the split existing in the material after ignition of the propellent charge.

The invention is based on the object of fragmenting natural rock, concrete, masonry and the like more effectively than with the known means.

This object is solved by an industrial cartridge with the features set out in the characterising part of claim 1.

The industrial cartridge according to the invention contains a propellent charge of at least two propellant charge powders arranged one after the other burning with different speed. In this way the result is achieved that the cartridge yields, after giving off the main pressure impulse at least a further gas pressure impulse, whereby the material already containing a split is broken down completely. The cartridge according to the invention possesses a further advantage in that the propellent charge contained in it can be formed according to the requirements for matching of the charge strength to the material to be split. In this way, the risk of hitting or flying stone as a consequence of too great a charge s reduced. Furthermore, there is the improved possibility of measuring of the propellent charge or its strength for the splitting of valuable material, for example in breaking marble where it is of advantage to keep the stressing of the material as low as possible.

In a more advantage embodiment of the industrial cartridge according to claim 2, there are present two of these propellent charge powders which burn with different speeds. This is achieved by the selection of the powders. According to claim 3, the cartridge can also contain propellent charge powders of different granularity. This makes it possible to fix or influence the speed of combustion of the powder. The formation of the industrial cartridge according to claim 4 is a preferred solution with which a sequential burning off of the propellant charge powders is achieved especially simply in the desired sequence.

In the embodiment according to claim 5, there is claimed the most suitable formation of the closure of the casing. As a result of the high compressibility of the closure material, it is achieved that the propellant charge powder located thereunder only burns off completely before the gas yielded thereby can escape.

The industrial cartridge according to the

invention can be used in different apparatuses for different areas of industry. Thus for example, the removal of slag residues in the metallurgical industry is possible with the aid of the cartridges.

The invention is described further hereinafter with reference to a constructional example shown in the drawing.

The Figure shows an industrial cartridge in longitudinal section. The casing 9 with the base piece 1 contains the propellent charge powders 2,3. Casing and base piece consist for example of aluminium, brass or a plastics, such as for example polyethylene. They can be formed in one or two pieces. The propellent charge powders 2,3 are advantageously nitrocellulose powders which optionally contain nitroglycerine. They differ in their rates of combustion. Preferably, the propellent charge powder 2 burns away more rapidly than the propellent charge powder 3. The more rapidly burning powder requires, in contrast to substances employed as explosives, approximately ten times the time for combustion. The slower burning powder requires, in contrast to that burning more rapidly approximately double the time for the combustion. The different burning speed for the propellent charge powder is obtained in known manner by different composition and/or granularity of the powders.

The propellent charge powder 3 is ignited later than the propellent charge powder 2. The difference amounts to to 1/100 seconds. What is achieved thereby is that the propellent charge powder 2 is ignited by the ignition gases of a mechanically or electrically released charge 4 directly over an ignition guide tube 5 axially arranged open at the end turned away from the base piece 1, which is provided with the closure 10 and optionally in the region of the propellant charge powder 2 with radially arranged ignition openings. Ignition guide tube 5 and closure 10 can also be formed in one piece, for

example in one procedure, injection moulded from a plastic. The closure 10 is thinner than the wall of the ignition guide tube. Preferably the closure 10 consists of a foil of about 0.2 mm thickness. The propellent charge powder 3 is secondarily ignited by the flame existing after ignition of the propellant charge powder 2.

The propellent charge powders 2,3 are separated from one another by a gas permeable covering 7 extending across the casing. The gas permeable covering 7 consists for example of felt, fabric, foam or discs of metal - e.g. aluminium - or plastic provided with braking positions. The gas permeable covering 7 is held by a cup-shaped member 12 which consists preferably of a plastic, such as for example polyethylene. The casing 9 contains a compressible closure 6 at its end opposite the base piece 1. The closure 6 is appropriately held by a disc 13 on the inner casing 14. It can however also be held otherwise for example by internal projections on the casing 9. The closure 6 consists for example of filamentary felt, and a disc 13 and inner casing 14 of polyethylene. The closure 6 is held on the end of the casing 9 opposite the base piece 1 by a further disc 15 which consists likewise preferably of polyethylene. The closure 6 is compressible to 25 to 30% of its original volume. The compression takes place by the gases existing after the ignition of the propellent charge powder 2. Within the compression time lasting only micro seconds, the propellent charge powder 2 burns up completely. Then the closure 6 and the discs 13,15 are broken up by the increased gas pressure or flung out of the casing 9, and the gas yielded flows out.

The cartridge according to the invention is provided with a casing edge 8 in such a manner that the cartridge cannot be used in the usual commercial weapons such as for example signal pistols.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Industrial cartridge with a casing containing a propellent charge, a base piece and arranged axially in the casing, an ignition guide tube which is connected to the base piece along with an igniter therearranged, characterised by the following features:

a) The propellent charge is composed of at least two propellent charge powders (2,3) burning with different speeds, arranged one after the other, which are separated from one another by a gas permeable covering (7) extending across towards the casing axis;

b) The ignition guide tube (5) possesses, provided at the level of the second or last propellent charge powder (2) away from the base piece, a covering (10) which is thinner than the wall (11) of the ignition guide tube;

c) The casing (9) contains at its end disposed opposite to the base piece (1) a closure (6) of a compressible material.

2. Industrial cartridge according to claim 1, characterised in that the casing (9) contains two propellent charge powders (2,3) arranged one after the other, with the propellent charge powder (2) located at the level of the covering (10) of the ignition guide tube (5) burning more rapidly than the other propellent charge powder (3).

3. Industrial cartridge according to claims 1 or 2, characterised in that the propellent charge powders (2,3) possess different granularities.

4. Industrial cartridge according to one of claims 1 to 3, characterised in that the covering (10) of the ignition guide tube (10) consists of a foil of about 0.2 mm thickness.

5. Industrial cartridge according to one of claims 1 to 4, characterised in that the closure (6) of the casing (9) is compressible to 25 to 30% of its original volume.

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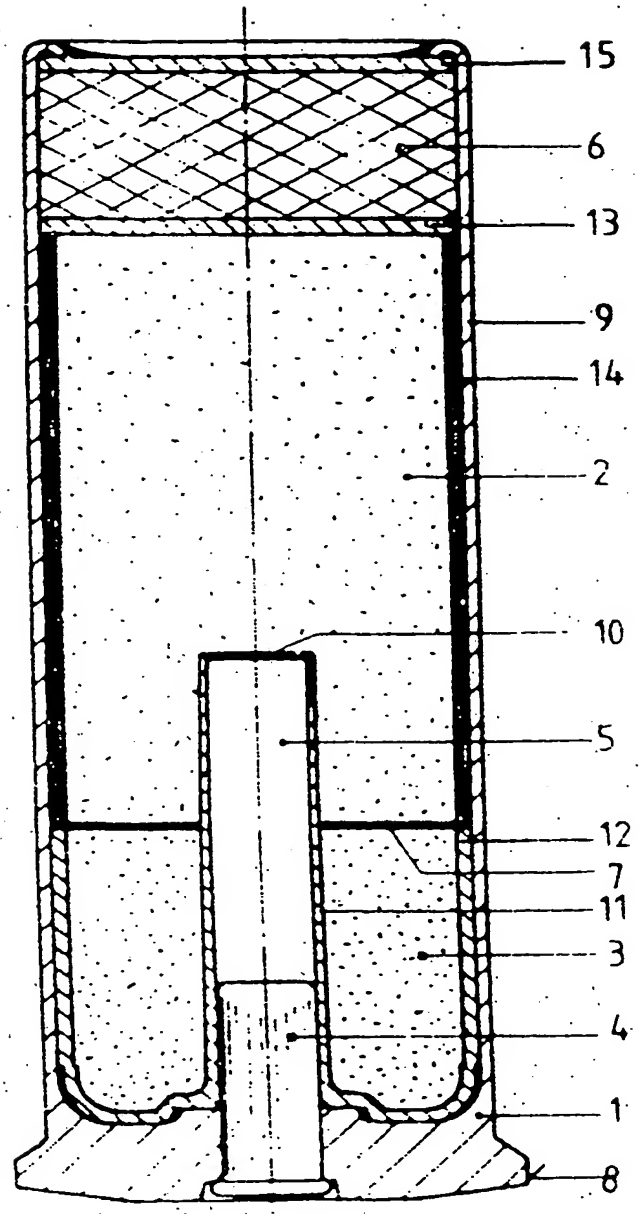
DYNAMIT NOBEL AKTIENGESELLSCHAFT

By Its Patent Attorneys:

CLEMENT HACK & CO.

Fellows Institute of Patent Attorneys of Australia.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